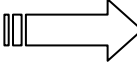


## Extra help on Ions

Atoms that lose or gain electrons are known as ions. The type of bond formed between ions is known as an ionic bond. Metal atoms undergo chemical reactions in which they lose electrons to form positive ions. Non metal atoms undergo chemical reactions in which they gain electrons to form negative ions.


The atoms in group I are highly reactive metals and easily lose the one electron in the valence shell.

 Draw diagrams in the boxes below (**use + for proton, n for neutron and X for electrons**) of a sodium atom and a sodium cation (this is a sodium atom which has lost one electron to another atom)

**sodium atom**

number of electrons (negatives) is

number of protons (positives) is



**sodium ion**

number of electrons (negatives) is

number of protons (positives) is

The sodium (Na) atom loses 1 valence electron to become a sodium ion (Na<sup>+</sup>). A sodium ion has a + charge because it has an uneven number of negative electrons and positive protons. A Na<sup>+</sup> ion has 11 positive protons but only 10 negative electrons because 1 valence electron has been lost to another atom.

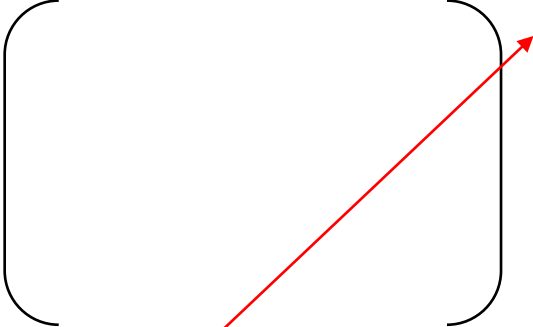
 The atoms in group II are mildly reactive metals and lose two electrons from their valence shell.

Similarly, draw a dot and cross diagram of a magnesium atom and a magnesium ion.

**magnesium atom**

number of electrons (negatives) is

number of protons (positives) is



**magnesium ion**

number of electrons (negatives) is

number of protons (positives) is

Try to work out the charge on a magnesium ion by counting the number of negative electrons and positive protons. Whichever one there is more of will be the charge on the magnesium ion

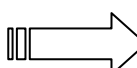
Instead of drawing diagrams, chemists can save time (and ink!) by writing out the electron configuration, some examples are shown in the table below

the electron configuration for a sodium atom is 2,8,1

This means that the 1<sup>st</sup> shell of a sodium atom has 2 electrons, in the 2<sup>nd</sup> shell there are 8 electrons and outer shell there is 1 electron

the electron configuration for a sodium ion is 2,8

This means that in the 1<sup>st</sup> shell of a sodium has 2 electrons, and in the 2<sup>nd</sup> shell (which is now the outer shell) there are 8 electrons. So, a sodium ion has lost 1 electron and has a positive charge

 You may like to try writing out the electron configuration for atoms and ions, **or** skip below and continue to draw out dot and cross diagrams

magnesium atom \_\_\_\_\_

magnesium ion \_\_\_\_\_ so the charge on a magnesium ion is \_\_\_\_\_

calcium atom \_\_\_\_\_

calcium ion \_\_\_\_\_ so the charge on a calcium ion is \_\_\_\_\_

oxygen atom \_\_\_\_\_

oxide ion \_\_\_\_\_ so the charge on an oxide ions is \_\_\_\_\_

chlorine atom \_\_\_\_\_

chloride ion \_\_\_\_\_ so the charge on a chloride ion is \_\_\_\_\_

argon atom \_\_\_\_\_

**OR**

Draw diagrams of a calcium atom and a calcium ion, you may use either X or • to represent the electrons

**calcium atom**

number of electrons (negatives) is

number of protons (positives) is

**calcium ion**

number of electrons (negatives) is

number of protons (positives) is

Again, try to work out the charge on a calcium ion by counting the number of negative electrons and positive protons. Whichever one there is more of will be the charge on the calcium ion.

Try to complete the diagrams over the page of anions (non-metals atoms that have gained electrons)

The atoms in group XVI are mildly reactive non metals and gain two electrons. Draw dot and cross diagrams of an oxygen atom and an oxide ion

**oxygen atom**

number of electrons (negatives) is

number of protons (positives) is

**oxide ion**

number of electrons (negatives) is

number of protons (positives) is

Similarly, try to work out the charge on an oxide ion by counting the number of negative electrons and positive protons. Whichever one there is more of will be the charge on the oxide ion.

→ The non-metals in Group XVII are highly reactive as they gain 1 electron.

**chlorine atom**

number of electrons (negatives) is

number of protons (positives) is

**chloride ion**

number of electrons (negatives) is

number of protons (positives) is

Finally, try to work out the charge on a chloride ion.

→ The noble gases are very unreactive as they already have a full outer shell, so they do not form ions.

**helium atom**

number of electrons (negatives) is

number of protons (positives) is

**argon atom**

number of electrons (negatives) is

number of protons (positives) is

## Charges on ions

Atom				Ion					
	number of protons	number of electrons	number of neutrons	number of protons	number of electrons	number of neutrons	charge	cation or anion?	name of ion
Li									
Cl									chloride
K									
Mg									
F									fluoride
Al									
O									oxide
Ca									
F									fluoride

**Conclusion:** I can see from my table that as atoms lose electrons they become ions with a \_\_\_\_\_ charge because the ions have more \_\_\_\_\_ in the nucleus. As atoms gain electrons they become ions with a \_\_\_\_\_ charge because the ions have more \_\_\_\_\_ in the valence shell.